

SUPPLEMENTAL SEDIMENT PROGRAM NARRATIVE

As a supplement to the 2004-2006 USEPA Remedial Investigation (RI) sampling program, Malcolm Pirnie, Inc. collected sediment samples from the Upper Passaic River, Lower Passaic River, and its tributaries (Second River, Third River, and Saddle River) between December 6, 2007 and January 30, 2008.¹ This supplemental program included the collection of core top samples (representing 0-1 inch depth of surface sediments) and low resolution sediment cores to support the refinement of the conceptual site model (CSM) for the Lower Passaic River Restoration Project. The following narrative summarizes the collected sediment samples and requested analyses.

Field work was conducted in accordance with the Lower Passaic River Restoration Project Work Plan (Malcolm Pirnie, Inc., January 2006) and the Lower Passaic River Restoration Project Quality Assurance Project Plan (QAPP; Malcolm Pirnie, Inc., August 2005) and its accompanying addendum (dated December 2007). The methods used to collect the low resolution cores are described in Section 5.0 of Field Sampling Plan (FSP) Volume 1 (Malcolm Pirnie, Inc., January 2006) with specific procedures outlined in Standard Operating Procedure (SOP) #9 “Vibracoring-Collecting High and Low Resolution Cores”, and SOP #12 “Core Processing – Low Resolution.” Methods describing surface sediment samples collection are described in the QAPP/FSP Addendum Attachment 15 – SOP 24 “Collecting Surface Sediments Using an Ekman or Ponar Dredge.”

SUMMARY OF SUPPLEMENTAL SEDIMENT PROGRAM

To meet the data needs and objectives described in FSP Volume 1 and the QAPP/FSP Addendum, the following steps were implemented to conduct the Supplemental Sediment Program:

- Evaluate target locations for core top samples using beryllium-7 data collected in the Lower Passaic River and Upper Passaic River from September 14, 2005 to October 25, 2005, and conduct field reconnaissance in tributaries to identify locations with fine-grained sediments.
- Collect core top samples using an Ekman dredge, process samples, and analyze for a suite of parameters, including beryllium-7, which is an indicator of recently deposited sediments.
- Classify sediment texture above river mile (RM) 8 to the Dundee Dam in the Lower Passaic River using a probing technique and evaluate target locations for low resolution cores.
- Collect low resolution sediment cores (one core per location).
- Divide low resolution core into two slices with the top slice characterizing the upper 6-inches of sediment, process samples, and analyze.
- Remaining material was disposed in the field; no archive material remains.

¹ As part of this supplemental 2007-2008 field work, water column samples and sediment trap samples were collected during high-flow storm events to characterize solids transport to the Lower Passaic River from tributaries, the Upper Passaic River (over Dundee Dam), from combined sewage overflow sites, and from stormwater outfall sites. These samples are described in a separate narrative and are available in the project database under survey identification number 20010.

DETAILS OF THE CORE TOP SAMPLING PROGRAM

Core top samples were collected from the Upper Passaic River, Lower Passaic River, Second River, Third River, and Saddle River using an Ekman dredge (Figure 1). At each location, the boat was anchored (tributary locations were accessed by wading), and the depth of the water was measured. The Ekman dredge, with polycarbonate liner and extension rods, was then advanced to the sediment surface typically to about 4-inches, where the dredge was pushed into the sediments. The dredge was tripped, closing the jaws of the dredge, and then the sediment sample within the Ekman dredge was retrieved. At the water surface, the water in the dredge was decanted off the top and the dredge was placed vertically into an aluminum lined receiving pan. Two field personnel then quickly opened the dredge and pushed it firmly flat onto the bottom of the receiving pan. The polycarbonate liner was then released from within the dredge leaving only the liner with the sediment intact in the receiving pan. A decontaminated stainless steel spatula was then used to scoop the top 1-inch of sediment into a decontaminated stainless steel bowl. The sample was homogenized in the bowl using American Society for Testing and Materials (ASTM) mixing protocols. The sample was then scooped into the appropriate sample jars for shipment to the laboratories. Refer to the QAPP/FSP Addendum SOP for more detail. A photograph of the Ekman dredge is presented in Figure 2.

Upper Passaic River and Lower Passaic River Core Top Sampling:

Core top sampling locations on the Upper Passaic River and Lower Passaic River were identified using beryllium-7 data (collected by Malcolm Pirnie, Inc. between September 14, 2005 and October 25, 2005), sediment texture data (as interpreted from side-scan sonar images by Aqua Surveys, Inc.), and field reconnaissance efforts. Core top samples on the Lower Passaic River were collected between December 6, 2007 and December 11, 2007. Samples from the Upper Passaic River in Dundee Lake were collected on January 8, 2008. Table 1 provides information for querying samples in the project database. Duplicate samples are listed in Table 2. Field notes are provided in the “Comments” field in the *dbo_Samples* table in the project database.

Table 1: Core Top Samples Collected on the Upper Passaic River and Lower Passaic River

Field Core Name	Sample Date	Sample Identification in Database	Core Identification in Database	Location Identification in Database
SurSed Passaic-A-RM12.6	12/6/2007	LPRP-SCSH-PSR-001584	5194	G0000044
SurSed Passaic-C-RM12.3	12/6/2007	LPRP-SCSH-PSR-001581	5191	G0000041
SurSed Passaic-D-RM11.0	12/6/2007	LPRP-SCSH-PSR-001580	5190	G0000040
SurSed Passaic-E-RM10.8	12/6/2007	LPRP-SCSH-PSR-001578	5188	G0000038
SurSed Passaic-F-RM10.1	12/6/2007	LPRP-SCSH-PSR-001576	5186	G0000036
SurSed Passaic-G-RM09.9	12/6/2007	LPRP-SCSH-PSR-001585	5195	G0000045
SurSed Passaic-H-RM14.1	12/6/2007	LPRP-SCSH-PSR-001577	5187	G0000037
SurSed Passaic-I-RM14.6	12/6/2007	LPRP-SCSH-PSR-001582	5192	G0000042
SurSed Passaic-J-RM14.5	12/10/2007	LPRP-SCSH-PSR-001587	5197	G0000047
SurSed Passaic-K-RM08.7	12/10/2007	LPRP-SCSH-PSR-001594	5204	G0000054
SurSed Passaic-L-RM07.8	12/10/2007	LPRP-SCSH-PSR-001586	5196	G0000046
SurSed Passaic-M-RM06.4	12/10/2007	LPRP-SCSH-PSR-001593	5203	G0000053
SurSed Passaic-N-RM05.2	12/10/2007	LPRP-SCSH-PSR-001595	5205	G0000055
SurSed Passaic-O-RM04.9	12/10/2007	LPRP-SCSH-PSR-001588	5198	G0000048
SurSed Passaic-P-RM04.1	12/10/2007	LPRP-SCSH-PSR-001592	5202	G0000052
SurSed Passaic-Q-RM03.6	12/10/2007	LPRP-SCSH-PSR-001591	5201	G0000051
SurSed Passaic-R-RM02.2	12/11/2007	LPRP-SCSH-PSR-001603	5212	G0000062
SurSed Passaic-S-RM02.7	12/11/2007	LPRP-SCSH-PSR-001598	5207	G0000057
SurSed Passaic-T-RM02.2	12/11/2007	LPRP-SCSH-PSR-001601	5210	G0000060
SurSed Passaic-U-RM01.4	12/11/2007	LPRP-SCSH-PSR-001597	5206	G0000056
SurSed Passaic-V-RM01.3	12/11/2007	LPRP-SCSH-PSR-001599	5208	G0000058
SurSed Passaic-W-RM01.0	12/11/2007	LPRP-SCSH-PSR-001600	5209	G0000059
SurSed Dundee-1	1/8/2008	LPRP-SCSH-PSR-001602	5211	G0000061
SurSed Dundee-2	1/8/2008	LPRP-SCSH-PSR-001579	5189	G0000039
SurSed Dundee-3	1/8/2008	LPRP-SCSH-PSR-001590	5200	G0000050
SurSed Dundee-4	1/8/2008	LPRP-SCSH-PSR-001589	5199	G0000049

Table 2: Duplicate Core Top Samples

Field Core Name	Parent	Duplicate
SurSed Passaic-N-RM05.2	LPRP-SCSH-PSR-001595	LPRP-SCSH-PSR-001596
SurSed Dundee-1	LPRP-SCSH-PSR-001602	LPRP-SCSH-PSR-001604

Tributary Core Top Sampling:

Prior to sampling, a field reconnaissance of the tributaries was conducted in December 2007 to identify depositional areas containing fine-grained material, assess access to the location, obtain permission to access the tributary locations, and select the locations that would eventually be sampled. Core top samples were collected on January 8, 2008.

Table 3 provides information for querying samples in the project database. Field notes are provided in the “Comments” field of the project database in the *dbo_Samples* table and discussed below.

Table 3: Core Top Samples Collected on Tributaries

Field Core Name	Sample Date	Sample Identification in Database	Core Identification in Database	Location Identification in Database
SurSed Saddle#1	1/8/2008	LPRP-SCSH-SDR-000006	5230	G00000148
SurSed Saddle#2	1/8/2008	LPRP-SCSH-SDR-000003	5221	G00000139
SurSed Saddle#3	1/8/2008	LPRP-SCSH-SDR-000004	5222	G00000140
SurSed Saddle#4	1/8/2008	LPRP-SCSH-SDR-000005	5223	G00000141
SurSed Third#1	1/8/2008	LPRP-SCSH-THR-000002	5224	G00000142
SurSed Third#2	1/8/2008	LPRP-SCSH-THR-000003	5225	G00000143

At Third River, the reconnaissance identified fine-grained sediments located in a small pond a few hundred yards upstream of the head-of-tide where the United States Geological Survey (USGS) gage station is located. Two sediment samples were collected using the Ekman dredge from Third River.

At Saddle River, many locations were identified where fine-grained sediments might be depositing. At one location², several attempts were made to collect a sample using the Ekman dredge; however, due to the presence of leaf debris on the bottom of the river, samples could not be collected with the dredge. During each attempt, the leaves disturbed the surficial sediments as the dredge was pushed down into the sediment deposit, resulting in sediment resuspension. Alternatively, a small aluminum pan was slowly submerged into the water, and sediments were carefully scooped into the pan from the top 1-inch of the sediment surface using a decontaminated stainless steel spatula. After sufficient material was retrieved, the pan was removed from the river, the sediments were allowed to settle, the water was decanted, and the sediments were transferred into a decontaminated stainless steel bowl where they were homogenized and transferred into laboratory sample containers. A total of four sediment samples were collected using the Ekman dredge from Saddle River.

Insufficient amounts of fine-grained sediments were observed on Second River during the reconnaissance to warrant sampling. This tributary is channelized (*e.g.*, vertical concrete walls and cobblestone bottom at most locations), and the water depth during very heavy storms will increase from a base height of less than one foot (at most locations) to six or eight feet, or higher. This rapidly moving water scours out all or most of the sediments within the Second River channel. In addition to the tributary reconnaissance, locations just below the Dundee Dam in the Lower Passaic River near Ackerman Avenue Bridger were evaluated. However, this location contained insufficient amounts of fine-grained sediments within easily accessible locations (*i.e.*, wading) due to the recurrence of rapidly moving floodwaters. Consequently, no core tops samples were collected from the Ackerman Avenue Bridge location and Second River.

Laboratory Analysis for Core Top Samples:

All the core top samples were analyzed for metals and total organic carbon (Accutest Laboratories; Dayton, New Jersey); grain size (GeoSea Consulting; British Columbia,

² Manual sample collected at LPRP-SCSH-SDR-000006 (field name SurSed Saddle#1).

Canada); and radiological parameters (Outreach Laboratories; Broken Arrow, Oklahoma).

Select samples that were identified as beryllium-7 bearing from the Outreach Laboratories data were sent to Rensselaer Polytechnic Institute for confirmatory radiological analyses. These samples were not validated as stated in the QAPP/FSP Addendum Worksheet 12. Data (as received) by Rensselaer Polytechnic Institute are provided as Attachment A. Table 4 lists the sample identification numbers for the radiological confirmatory analysis.

Table 4: Confirmatory Radiological Samples

Waterbody Location	Parent Sample Identification Number	Split Sample Identification Number
Lower Passaic River	LPRP-SCSH-PSR-001577	LPRP-SCSH-PSR-001608
Dundee Lake	LPRP-SCSH-PSR-001579	LPRP-SCSH-PSR-001675
Lower Passaic River	LPRP-SCSH-PSR-001580	LPRP-SCSH-PSR-001609
Lower Passaic River	LPRP-SCSH-PSR-001584	LPRP-SCSH-PSR-001610
Lower Passaic River	LPRP-SCSH-PSR-001585	LPRP-SCSH-PSR-001673
Lower Passaic River	LPRP-SCSH-PSR-001586	LPRP-SCSH-PSR-001611
Dundee Lake	LPRP-SCSH-PSR-001589	LPRP-SCSH-PSR-001674
Dundee Lake	LPRP-SCSH-PSR-001590	LPRP-SCSH-PSR-001670
Lower Passaic River	LPRP-SCSH-PSR-001591	LPRP-SCSH-PSR-001612
Lower Passaic River	LPRP-SCSH-PSR-001593	LPRP-SCSH-PSR-001613
Lower Passaic River	LPRP-SCSH-PSR-001595	LPRP-SCSH-PSR-001614
Lower Passaic River	LPRP-SCSH-PSR-001596	LPRP-SCSH-PSR-001615
Lower Passaic River	LPRP-SCSH-PSR-001597	LPRP-SCSH-PSR-001616
Lower Passaic River	LPRP-SCSH-PSR-001598	LPRP-SCSH-PSR-001617
Dundee Lake	LPRP-SCSH-PSR-001602	LPRP-SCSH-PSR-001671
Dundee Lake (duplicate for LPRP-SCSH-PSR-001602)	LPRP-SCSH-PSR-001604	LPRP-SCSH-PSR-001672

Note that three samples were requested for re-counting by Outreach Laboratories. The original data are provided in the project database; the requested re-counting data are provided in Table 5.

Table 5: Requested Radiological Re-Counting

Sample Identification Number	Re-Counted Beryllium-7 (pCi/g $\pm 1\sigma$)	Re-Counted Cesium-137 (pCi/g $\pm 1\sigma$)	Re-Counted Potassium-40 (pCi/g $\pm 1\sigma$)
LPRP-SCSH-PSR-001577	3.71 ± 2.43	0.067 ± 0.031	13.0 ± 1.24
LPRP-SCSH-PSR-001584	4.78 ± 2.92	0.110 ± 0.016	11.9 ± 1.17
LPRP-SCSH-PSR-001598	3.64 ± 2.66	0.156 ± 0.118	19.1 ± 1.89

All samples listed in Table 4 were then analyzed by Axys Analytical Services (British Columbia, Canada) for polychlorodibenzodioxin/furan (PCDD/F), polychlorinated biphenyl (PCB) congeners, polycyclic aromatic hydrocarbon (PAH), and pesticide analyses.

At the time that this narrative was written, the grain size data were not available on the project database. However, the data package (as received) from GeoSea Consulting is available in the project database download as a separate zip-file.

DETAILS OF THE LOW RESOLUTION SEDIMENT SAMPLING PROGRAM

Low resolution cores were collected from 23 locations on the Lower Passaic River between RM8 and the Dundee Dam (RM17.4) between January 16, 2008 and January 30, 2008 (Figure 1). Prior to core collection, three days of sediment probing was conducted in December 2007 and January 2008 (1) to field verify the sediment texture data (as interpreted from side-scan sonar images by Aqua Surveys, Inc.), (2) to locate the present day boundaries of the fine-grained sediment deposits, and (3) to locate otherwise unidentified fine-grained deposits for possible sampling.

Probing:

Probing field work was based on available bathymetric data and sediment texture data above RM8. A grid map was then prepared to easily identify [using the global positioning system (GPS)] potential sediment probing locations within known depositional areas. This mapping effort identified 579 probing locations; however, a total of 547 locations were assessed:

- Probing locations were added where the field boundaries of a deposit are beyond the mapped conditions.
- No probing was conducted at locations where the mapped points were located outside the field boundaries of the deposit.

Small diameter push cores were collected at every tenth location (approximately 10 percent of the locations) to confirm the data being reported from the probing. Push cores were retrieved, and sediments were classified to visually confirm what was being reported from the probing. Probing results are presented in Attachment B.

Low Resolution Sediment Coring:

Based on the probing data, 20 low resolution coring locations were identified on the Lower Passaic River above RM8. (At field location #10, a co-located core was also collected.) Three additional sites were also targeted to re-occupy SedFlume sites, which were originally occupied in 2004 by the United States Army Corps of Engineers. Table 6 provides information for querying samples in the project database. Duplicate samples are listed in Table 7. Field notes are provided in the “Comments” field of the project database in the *dbo_Samples* table.

Table 6: Low Resolution Core Samples Collected on the Lower Passaic River

Field Core Name*	Sample Date	Sample Identification in Database	Core Identification in Database	Location Identification in Database
EMBM-LR01-RM08.42	1/16/2008	LPRP-SCSH-PSR-1618 (slice 1); LPRP-SCSH-PSR-1619 (slice 2)	5231	G0000149
EMBM-LR02-RM08.50	1/16/2008	LPRP-SCSH-PSR-1620 (slice 1); LPRP-SCSH-PSR-1621 (slice 2)	5232	G0000150
EMBM-LR03-RM09.33	1/17/2008	LPRP-SCSH-PSR-1622 (slice 1); LPRP-SCSH-PSR-1623 (slice 2)	5233	G0000151
EMBM-LR04-RM09.37	1/17/2008	LPRP-SCSH-PSR-1624 (slice 1); LPRP-SCSH-PSR-1625 (slice 2)	5234	G0000152

Field Core Name*	Sample Date	Sample Identification in Database	Core Identification in Database	Location Identification in Database
EMBM-LR05-RM09.44	1/17/2008	LPRP-SCSH-PSR-1626 (slice 1); LPRP-SCSH-PSR-1627 (slice 2)	5235	G0000153
EMBM-LR06-RM09.60	1/17/2008	LPRP-SCSH-PSR-1628 (slice 1); LPRP-SCSH-PSR-1629 (slice 2)	5236	G0000154
EMBM-LR07-RM09.63	1/17/2008	LPRP-SCSH-PSR-1630 (slice 1); LPRP-SCSH-PSR-1631 (slice 2)	5237	G0000155
EMBM-LR08-RM09.75	1/17/2008	LPRP-SCSH-PSR-1632 (slice 1); LPRP-SCSH-PSR-1633 (slice 2)	5238	G0000156
EMBM-LR09-RM09.94	1/17/2008	LPRP-SCSH-PSR-1634 (slice 1); LPRP-SCSH-PSR-1635 (slice 2)	5239	G0000157
EMBM-LR10-RM10.05	1/17/2008	LPRP-SCSH-PSR-1636 (slice 1); LPRP-SCSH-PSR-1637 (slice 2)	5240	G0000158
EMBM-LR10colocate-RM10.05	1/17/2008	LPRP-SCSH-PSR-1656 (slice 1); LPRP-SCSH-PSR-1657 (slice 2)	5250	G0000168
EMBM-LR11-RM10.09	1/18/2008	LPRP-SCSH-PSR-1638 (slice 1); LPRP-SCSH-PSR-1639 (slice 2)	5241	G0000159
EMBM-LR12-RM10.77	1/18/2008	LPRP-SCSH-PSR-1640 (slice 1); LPRP-SCSH-PSR-1641 (slice 2)	5242	G0000160
EMBM-LR14-RM10.96	1/29/2008	LPRP-SCSH-PSR-1644 (slice 1); LPRP-SCSH-PSR-1645 (slice 2)	5244	G0000162
EMBM-LR15-RM11.10	1/29/2008	LPRP-SCSH-PSR-1646 (slice 1); LPRP-SCSH-PSR-1647 (slice 2)	5245	G0000163
EMBM-LR17-RM11.34	1/29/2008	LPRP-SCSH-PSR-1650 (slice 1); LPRP-SCSH-PSR-1651 (slice 2)	5247	G0000165
EMBM-LR18-RM12.25	1/16/2008	LPRP-SCSH-PSR-1652 (slice 1); LPRP-SCSH-PSR-1653 (slice 2)	5248	G0000166
EMBM-LR20-RM12.39	1/16/2008	LPRP-SCSH-PSR-1658 (slice 1); LPRP-SCSH-PSR-1660 (slice 2)	5251	G0000169
Sedflume-RM10.89	1/30/2008	LPRP-SCSH-PSR-1664 (slice 1); LPRP-SCSH-PSR-1665 (slice 2)	5257	G0000170
Sedflume-RM14.22	1/30/2008	LPRP-SCSH-PSR-1666 (slice 1); LPRP-SCSH-PSR-1667 (slice 2)	5258	G0000171
Sedflume-RM14.47	1/30/2008	LPRP-SCSH-PSR-1668 (slice 1); LPRP-SCSH-PSR-1669 (slice 2)	5259	G0000172

*Field Core Names are provided in the "Comments" field in the *dbo_Corings* table in the project database.

Table 7: Duplicate Low Resolution Core Samples

Field Core Name*	Parent	Duplicate
EMBM-LR04-RM09.37	LPRP-SCSH-PSR-001625	LPRP-SCSH-PSR-1661
EMBM-LR11-RM10.09	LPRP-SCSH-PSR-001639	LPRP-SCSH-PSR-1662

*Field Core Names are provided in the "Comments" field in the *dbo_Corings* table in the project database.

Low resolution cores were collected by Aqua Surveys, Inc. using a Vibracore.³ Cores penetrated to refusal or to the red-brown clay layer. Vibracore were collected using an

³ The QAPP/FSP Addendum (dated December, 2007) recommends the collection of low resolution cores using piston core techniques. However, probing data indicated that some newly identified fine-grained sediment deposits were 8 to 10 feet thick. Since 10-foot cores cannot be collected with a piston core, Aqua Surveys, Inc was subcontracted to collect Vibracores.

aluminum core barrel with a soft poly liner. To retrieve the sample from the soft liner, the liner and sample was placed into a trough that would carefully contain the liner. The liner was then sliced open (longitudinally) with a decontaminated knife and the outer surface of the sediment in the liner was scraped away. A representative portion of the remaining material was placed into a decontaminated stainless steel mixing bowl, homogenized, and placed into laboratory sample containers. Refer to FSP Volume 1 SOP for more detail; a photograph of the low resolution core is presented in Figure 3.

Twenty-three Vibracore tubes were retrieved; five of the cores were over eight feet in length with one core nine feet long. Each core was divided into two slices: the top slice represented the top 0-0.5 foot interval. The second slice was from the 0.5 foot depth to the bottom of the core. If red-brown clay was encountered, the second slice was from the 0.5-foot depth to the top of the red-brown clay layer. Refer to Attachment C for additional information on cores, including geological log and percent recovery.

Laboratory Analysis for Low Resolution Core Samples:

All the low resolution core samples were analyzed for PCDD/F, PAH, and pesticides (Axys Analytical Services; British Columbia, Canada); metals, total organic carbon, PCB Aroclor (Accutest Laboratories; Dayton, New Jersey); grain size (GeoSea Consulting; British Columbia, Canada); and radiological parameters (Outreach Laboratories; Broken Arrow, Oklahoma). For the low resolution cores, the radiological laboratory reported cesium-137 and potassium-40 for all samples. If beryllium-7 was detected in the top slice (0-6 inches), the laboratory was instructed to report these detections. Following approval by the USEPA, 12 sediment samples were selected at random for PCB congener analysis (Axys Analytical Services) in addition to PCB Aroclor analysis (Accutest Laboratories) to verify the PCB Aroclor results. Samples selected for PCB congener analysis are listed in Table 8.

Table 8: Samples Selected for PCB Congener Analysis

Waterbody Location	Parent Sample Identification Number	Duplicate Sample Identification Number
Lower Passaic River	LPRP-SCSH-PSR-001619	
Lower Passaic River	LPRP-SCSH-PSR-001622	
Lower Passaic River	LPRP-SCSH-PSR-001627	
Lower Passaic River	LPRP-SCSH-PSR-001630	
Lower Passaic River	LPRP-SCSH-PSR-001635	
Lower Passaic River	LPRP-SCSH-PSR-001638	
Lower Passaic River	LPRP-SCSH-PSR-001643	
Lower Passaic River	LPRP-SCSH-PSR-001646	
Lower Passaic River	LPRP-SCSH-PSR-001658	
Lower Passaic River	LPRP-SCSH-PSR-001625	LPRP-SCSH-PSR-001661
Lower Passaic River*	LPRP-SCSH-PSR-001665	

*Location corresponds to SedFlume site at RM 10.9.

At the time that this narrative was written, the grain size data were not available on the project database. However, the data package (as received) from GeoSea Consulting is available in the project database download as a separate zip-file.



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**Surface Sediment and Low Resolution Core Sampling
Locations for the Supplemental Sediment Program**
Lower Passaic River Restoration Project

Figure 1a
November 2008



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**Surface Sediment and Low Resolution Core Sampling
Locations for the Supplemental Sediment Program**
Lower Passaic River Restoration Project

Figure 1b
November 2008



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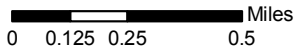
Legend

2007-2008 Surface Sediment Samples

2008 Low Resolution Cores

Shoreline as defined by the New Jersey Department of Environmental Protection

Lower Passaic River Centerline (1/10-Mile River Segments)



Surface Sediment and Low Resolution Core Sampling Locations for the Supplemental Sediment Program
Lower Passaic River Restoration Project

Figure 1c
November 2008



Field Photograph of Ekman Dredge
Supplemental Sediment Program
Lower Passaic River Restoration Project

Figure 2

November 2008



Field Photograph of Low Resolution Core
Supplemental Sediment Program
Lower Passaic River Restoration Project

Figure 3

November 2008

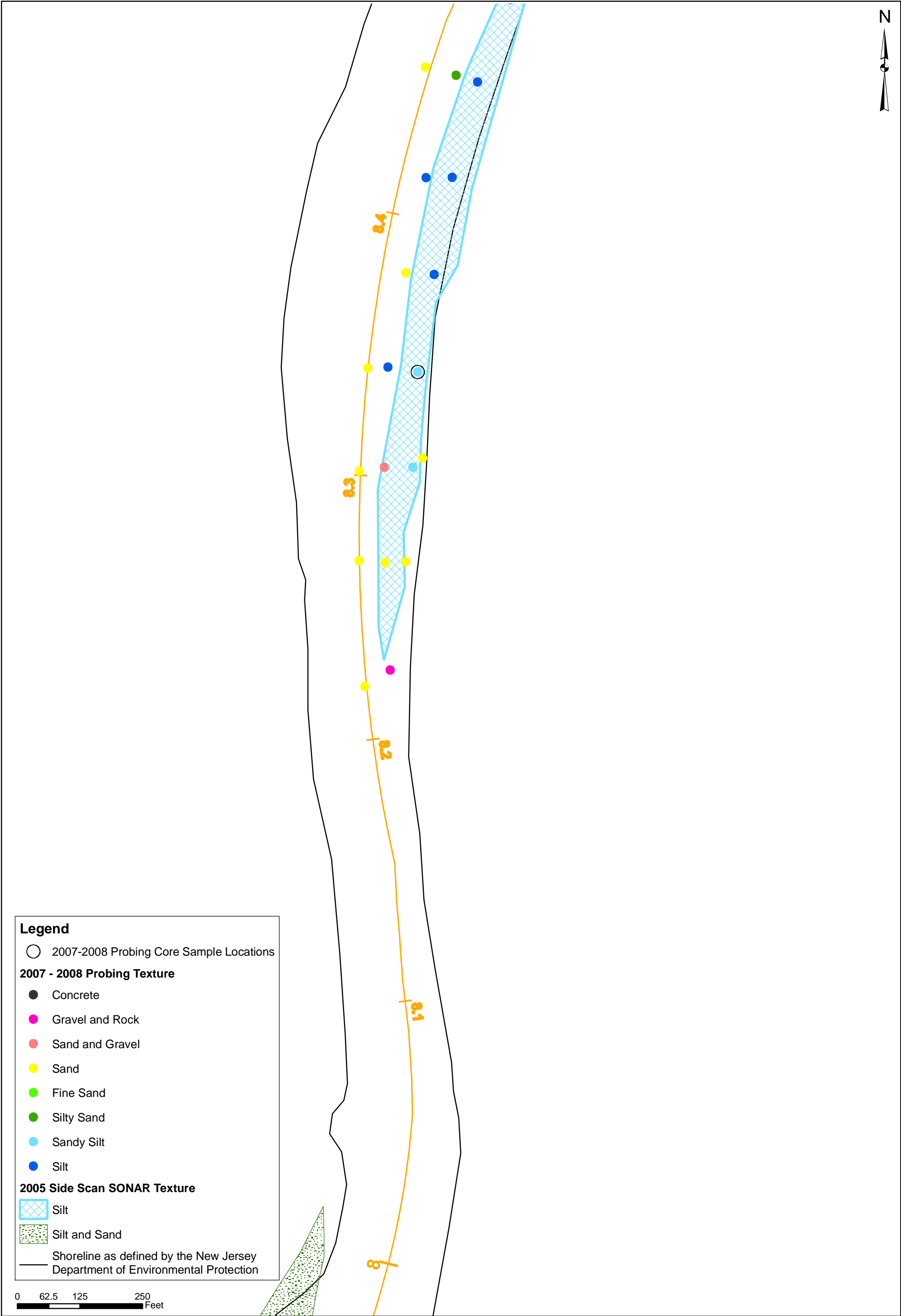
Attachment A

Rensselaer Polytechnic Institute Confirmatory Radiological Samples

Table A: Rensselaer Polytechnic Institute Confirmatory Radiological Samples

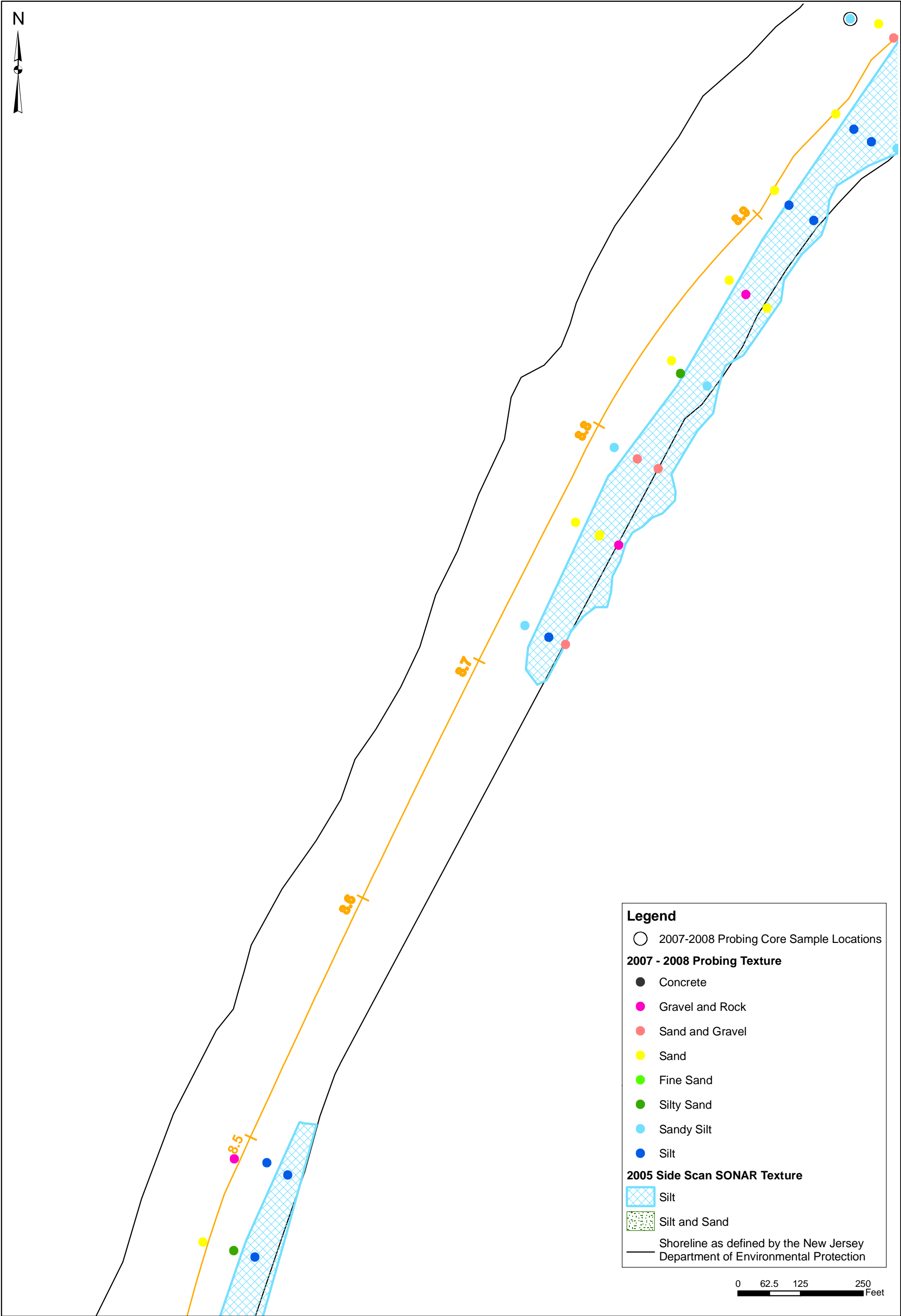
Waterbody	PREmis Sample Identification Number	Parent Sample	Sample Date	Be-7		Cs-137		K-40	
				pCi/g	1σ	pCi/g	1σ	pCi/g	1σ
Lower Passaic River	LPRP-SCSH-PSR-1608		12/6/2007	14.71	1.35	0.08	0.02	9.33	0.67
Lower Passaic River	LPRP-SCSH-PSR-1609		12/6/2007	5.81	0.41	0.24	0.03	12.15	0.76
Lower Passaic River	LPRP-SCSH-PSR-1610		12/6/2007	13.44	1.23	0.09	0.02	9.82	0.67
Lower Passaic River	LPRP-SCSH-PSR-1611		12/10/2007	8.62	0.61	0.19	0.03	11.86	0.85
Lower Passaic River	LPRP-SCSH-PSR-1612		12/10/2007	6.41	0.51	0.19	0.03	11.73	0.87
Lower Passaic River	LPRP-SCSH-PSR-1613		12/10/2007	2.56	0.34	0.11	0.03	9.90	0.77
Lower Passaic River	LPRP-SCSH-PSR-1614		12/10/2007	5.02	0.44	0.13	0.03	11.67	0.83
Lower Passaic River	LPRP-SCSH-PSR-1615		12/10/2007	4.46	0.44	0.15	0.03	10.86	0.81
Lower Passaic River	LPRP-SCSH-PSR-1616		12/11/2007	2.18	0.35	0.15	0.03	12.15	0.85
Lower Passaic River	LPRP-SCSH-PSR-1617		12/11/2007	8.62	1.16	0.14	0.03	11.15	0.79
Lower Passaic River	LPRP-SCSH-PSR-1663		2/7/2008	5.60	0.52	0.10	0.03	8.93	0.77
Dundee Lake	LPRP-SCSH-PSR-1670		1/8/2008	1.79	0.34	0.13	0.02	10.92	0.76
Dundee Lake	LPRP-SCSH-PSR-1670 (replicate)		1/8/2008	0.73	0.39	0.14	0.03	10.14	0.78
Dundee Lake	LPRP-SCSH-PSR-1670 (replicate 2)		1/8/2008	1.19	0.39	0.14	0.02	10.73	0.76
Dundee Lake	LPRP-SCSH-PSR-1671		1/8/2008	2.44	0.34	0.08	0.02	8.91	0.64
Dundee Lake	LPRP-SCSH-PSR-1671 (replicate)		1/8/2008	2.33	0.39	0.07	0.02	9.03	0.67
Dundee Lake	LPRP-SCSH-PSR-1672	Duplicate of LPRP-SCSH-PSR-1671	1/8/2008	1.51	0.35	0.05	0.02	9.51	0.71
Dundee Lake	LPRP-SCSH-PSR-1672 (replicate)	Duplicate of LPRP-SCSH-PSR-1671	1/8/2008	2.13	0.45	0.12	0.03	10.12	0.81
Lower Passaic River	LPRP-SCSH-PSR-1673		12/6/2007	6.28	0.87	0.26	0.04	9.64	0.93
Dundee Lake	LPRP-SCSH-PSR-1674		1/8/2008	1.11	0.31	0.11	0.02	9.57	0.67
Dundee Lake	LPRP-SCSH-PSR-1675		1/8/2008	1.09	0.43	0.09	0.03	9.28	0.78
Saddle River	LPRP-SCSH-SDR-000001		1/16/2008	18.52	1.03	0.11	0.03	8.92	0.70
Saddle River	LPRP-SCSH-SDR-000007		2/7/2008	3.78	0.52	0.12	0.03	8.08	0.85
Saddle River	LPRP-SCSH-SDR-000008		1/8/2008	6.70	0.57	0.04	0.02	8.30	0.69
Saddle River	LPRP-SCSH-SDR-000009		1/8/2008	6.60	0.58	0.08	0.02	8.59	0.68
Second River	LPRP-SCSH-SCR-000004		2/7/2008	3.25	0.29	0.07	0.02	6.62	0.47
Second River	LPRP-SCSH-SCR-000005		3/10/2008	10.96	0.68	0.09	0.03	8.07	0.69
Second River	LPRP-SCSH-SCR-000006		3/10/2008	2.74	0.25	0.08	0.02	9.27	0.67
Third River	LPRP-SCSH-THR-000001		1/16/2008	30.25	1.66	0.15	0.03	9.54	0.80
Third River	LPRP-SCSH-THR-000006		2/7/2008	17.51	1.28	0.12	0.03	7.09	0.77
Third River	LPRP-SCSH-THR-000007		1/8/2008	0.64	0.32	0.15	0.03	7.39	0.62
Third River	LPRP-SCSH-THR-000007 (replicate)		1/8/2008	1.10	0.36	0.12	0.02	7.92	0.62
Third River	LPRP-SCSH-THR-000008		1/8/2008	1.71	0.43	0.11	0.03	8.22	0.74

Attachment B
Sediment Texture from Probing above RM8



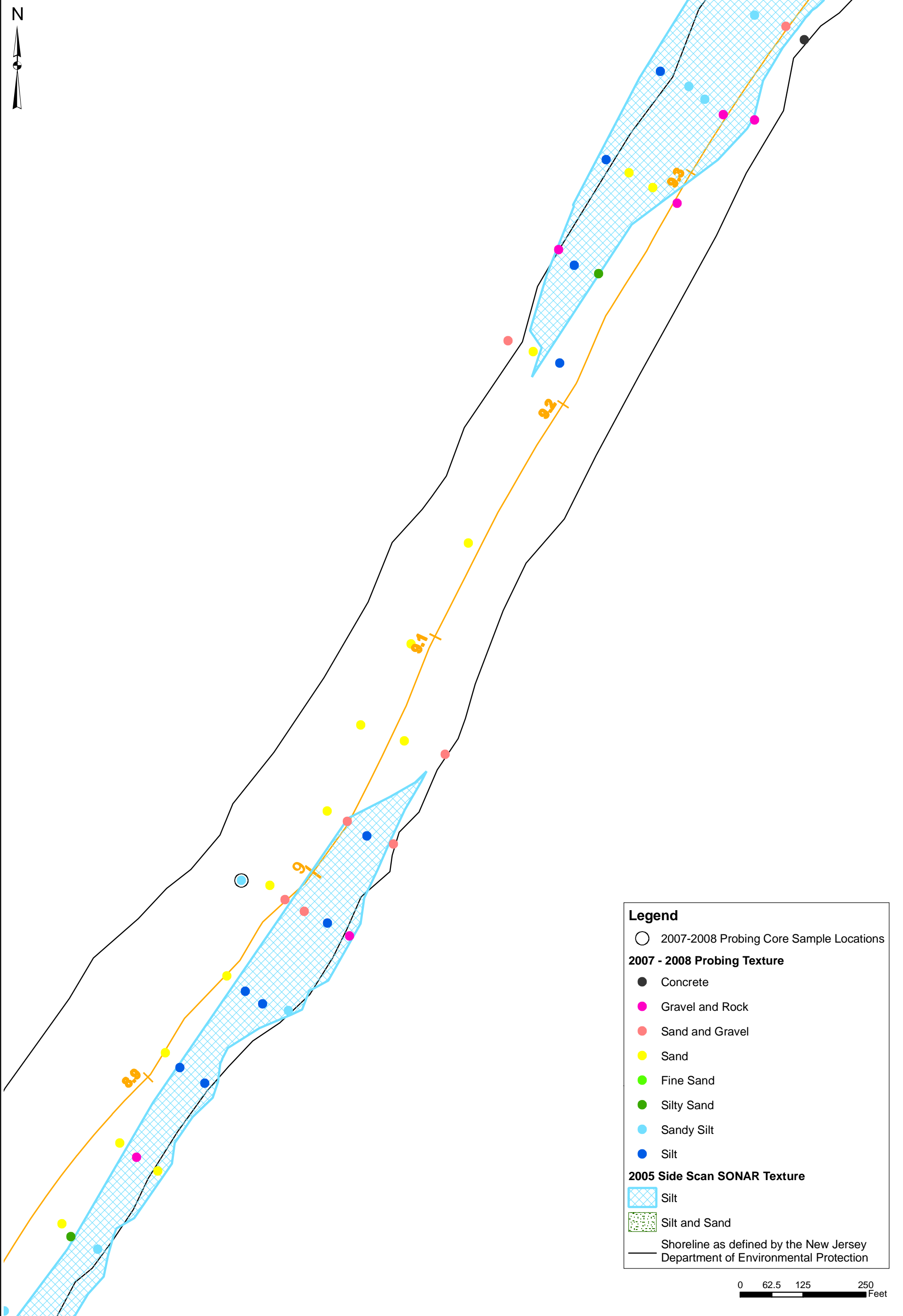
Sediment Texture from Probing Above RM8
Lower Passaic River Restoration Project

Figure B-1
August 2008



Sediment Texture from Probing Above RM8
Lower Passaic River Restoration Project

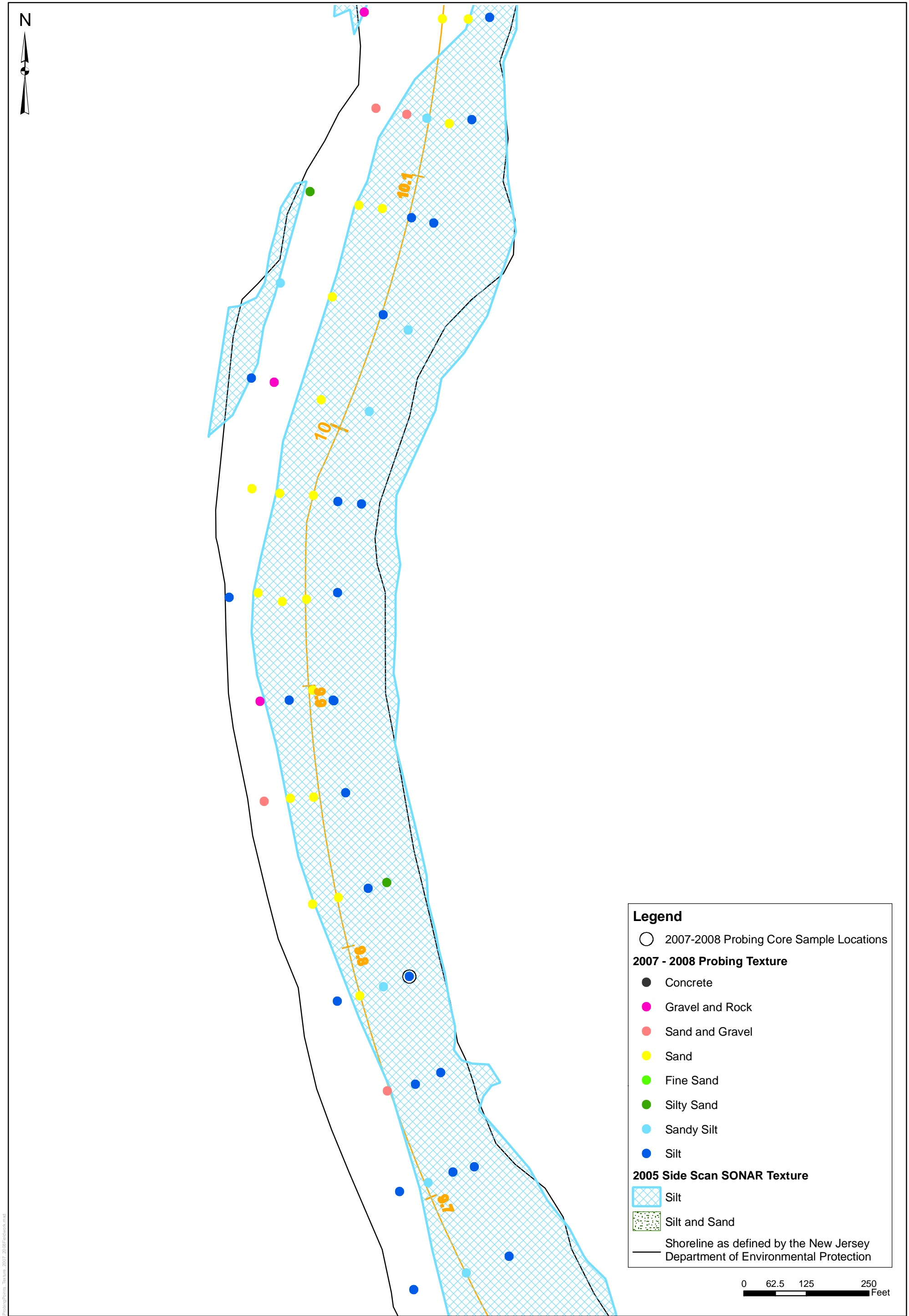
Figure B-2
August 2008



Sediment Texture from Probing Above RM8
Lower Passaic River Restoration Project

Figure B-3

August 2008



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Sediment Texture from Probing Above RM8
Lower Passaic River Restoration Project

Figure B-5
August 2008



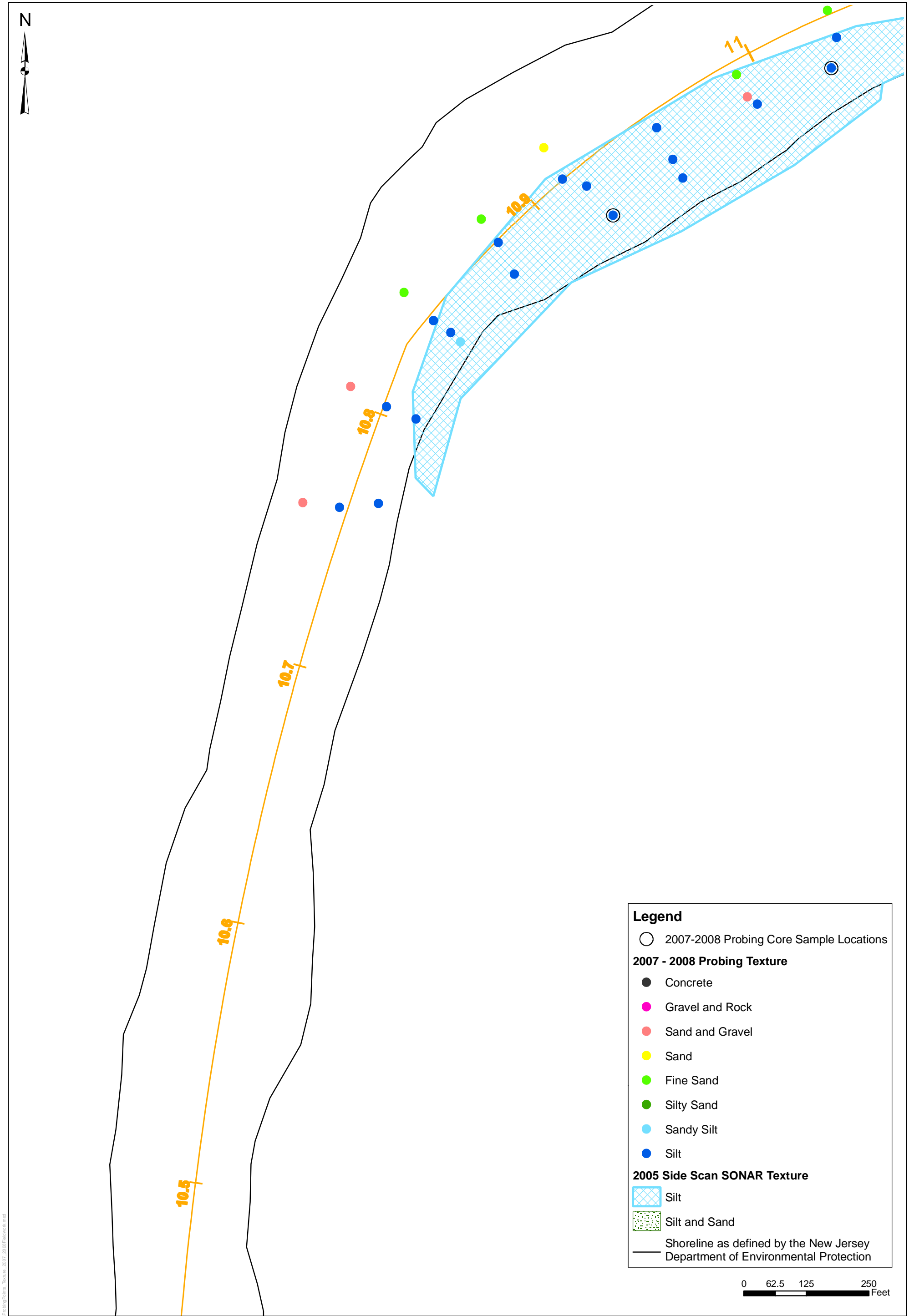
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Sediment Texture from Probing Above RM8
Lower Passaic River Restoration Project

Figure B-6

August 2008

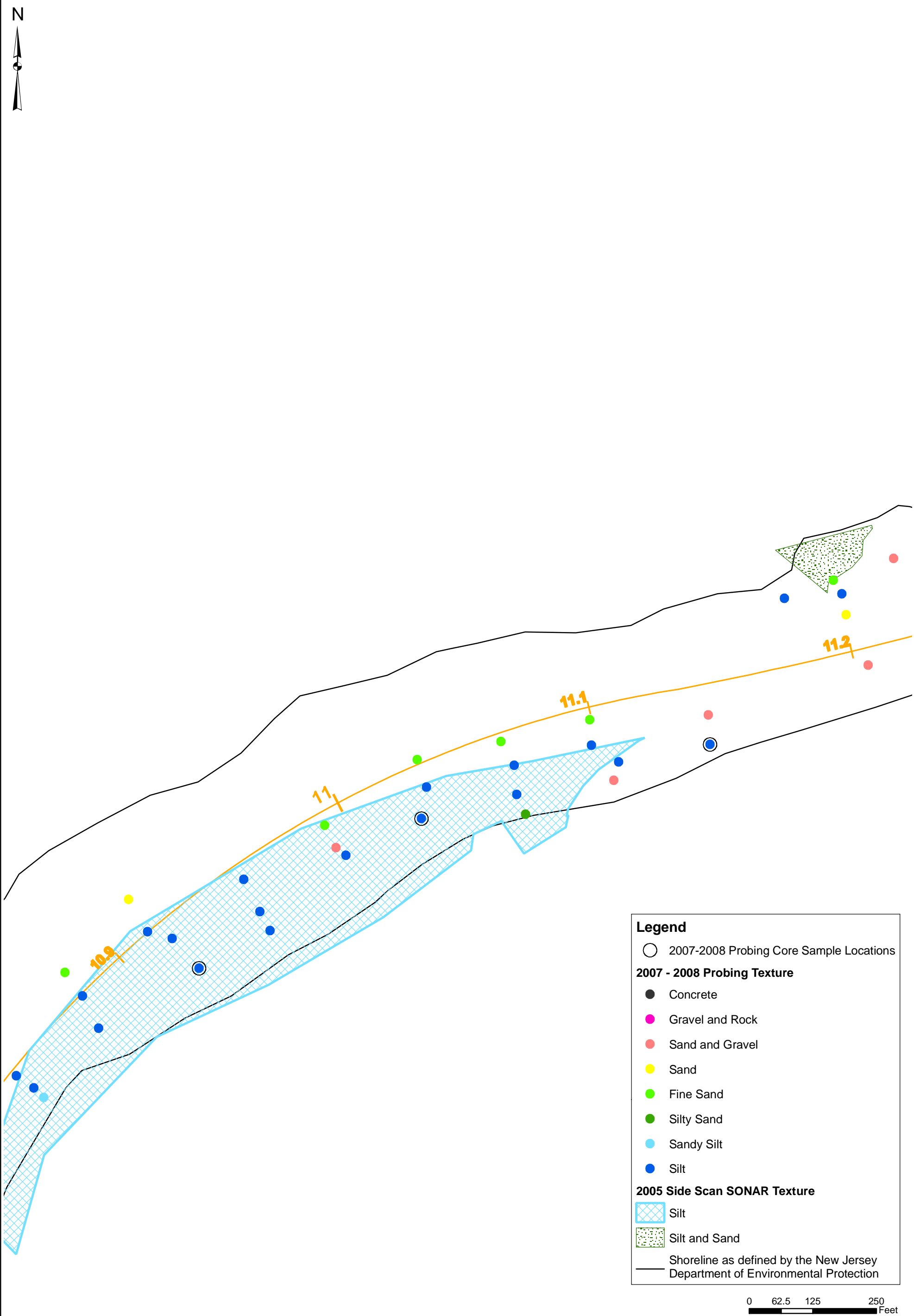


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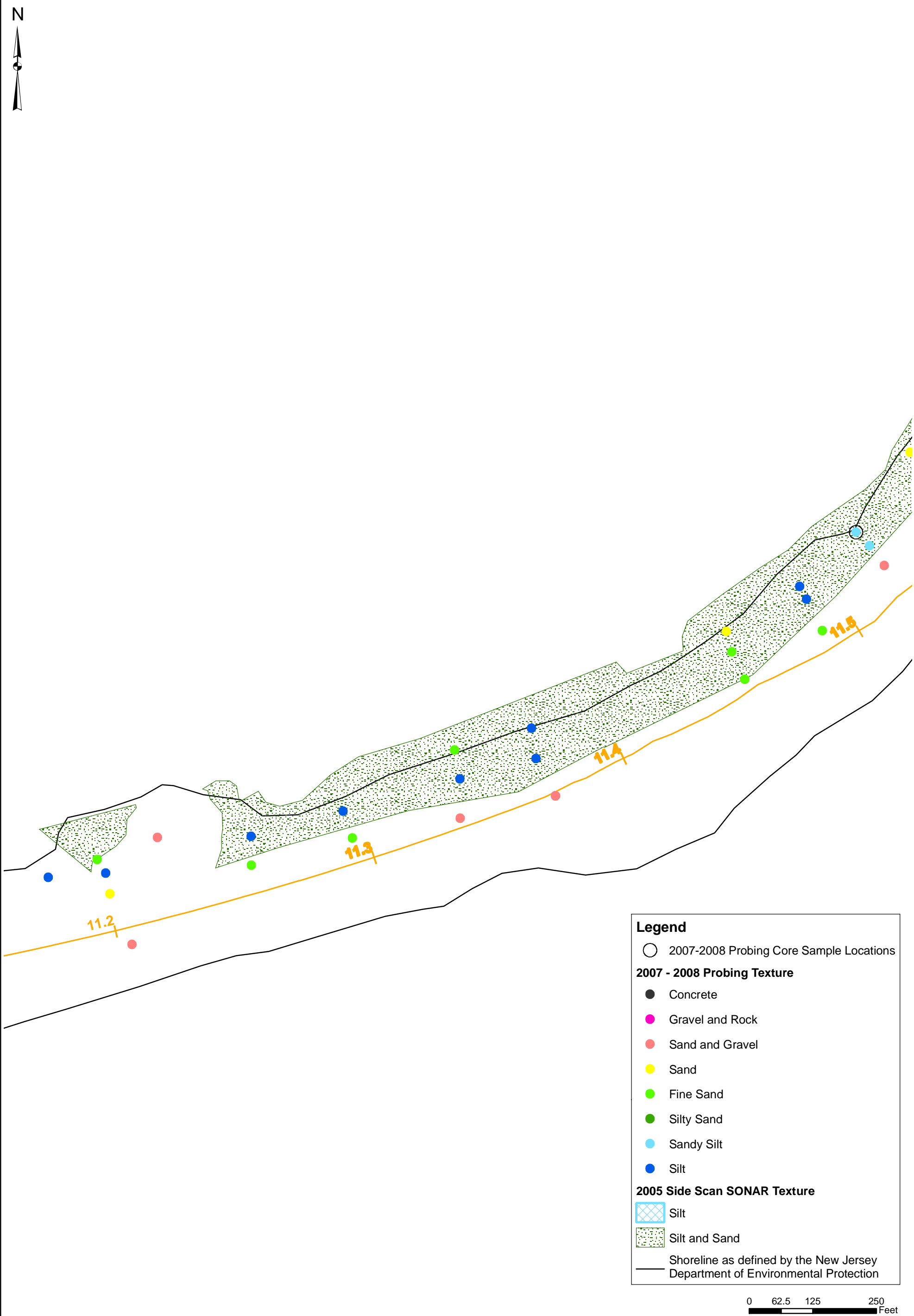
Sediment Texture from Probing Above RM8
Lower Passaic River Restoration Project

Figure B-7
August 2008



Sediment Texture from Probing Above RM8
Lower Passaic River Restoration Project

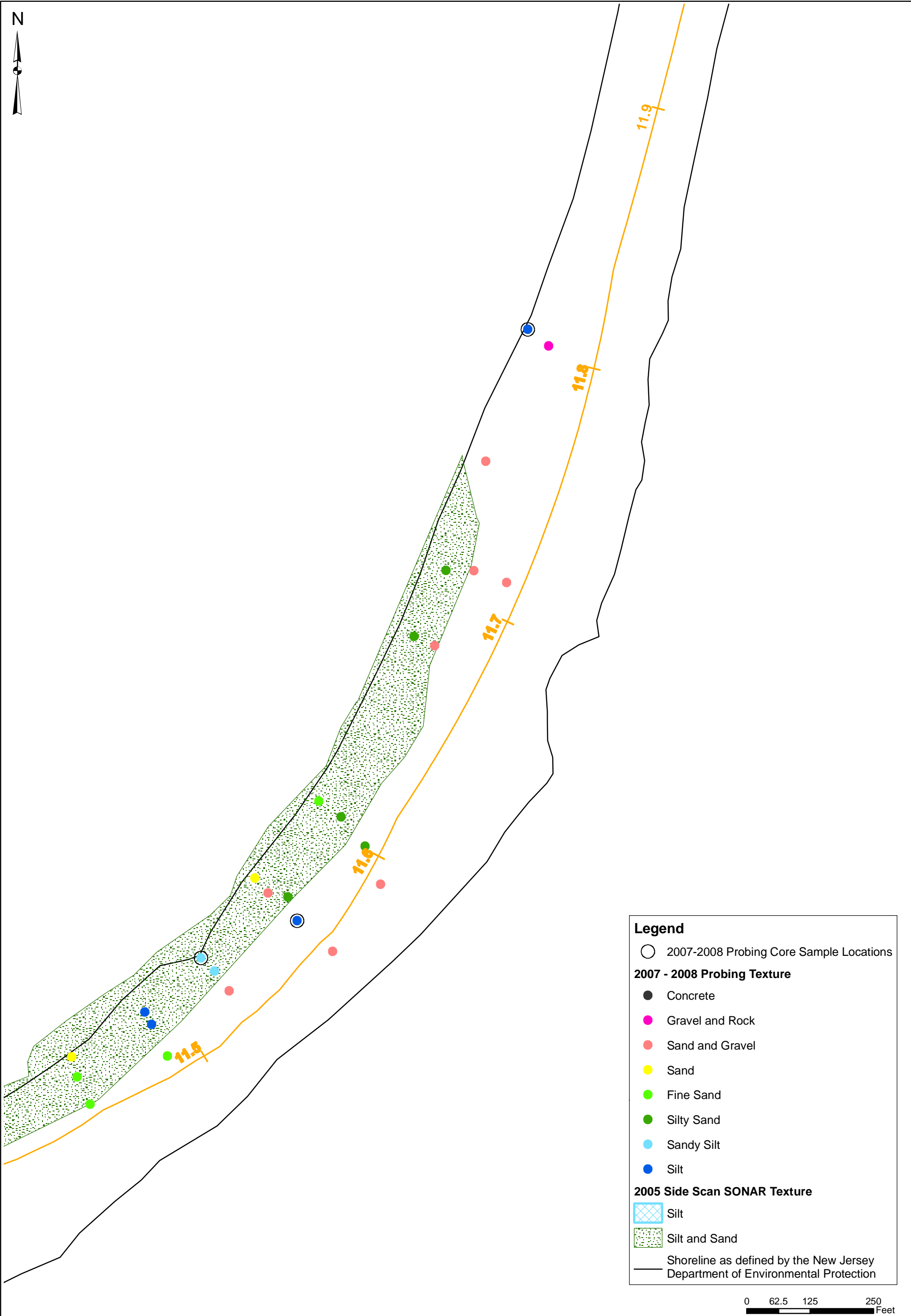
Figure B-8
August 2008



Sediment Texture from Probing Above RM8
Lower Passaic River Restoration Project

Figure B-9

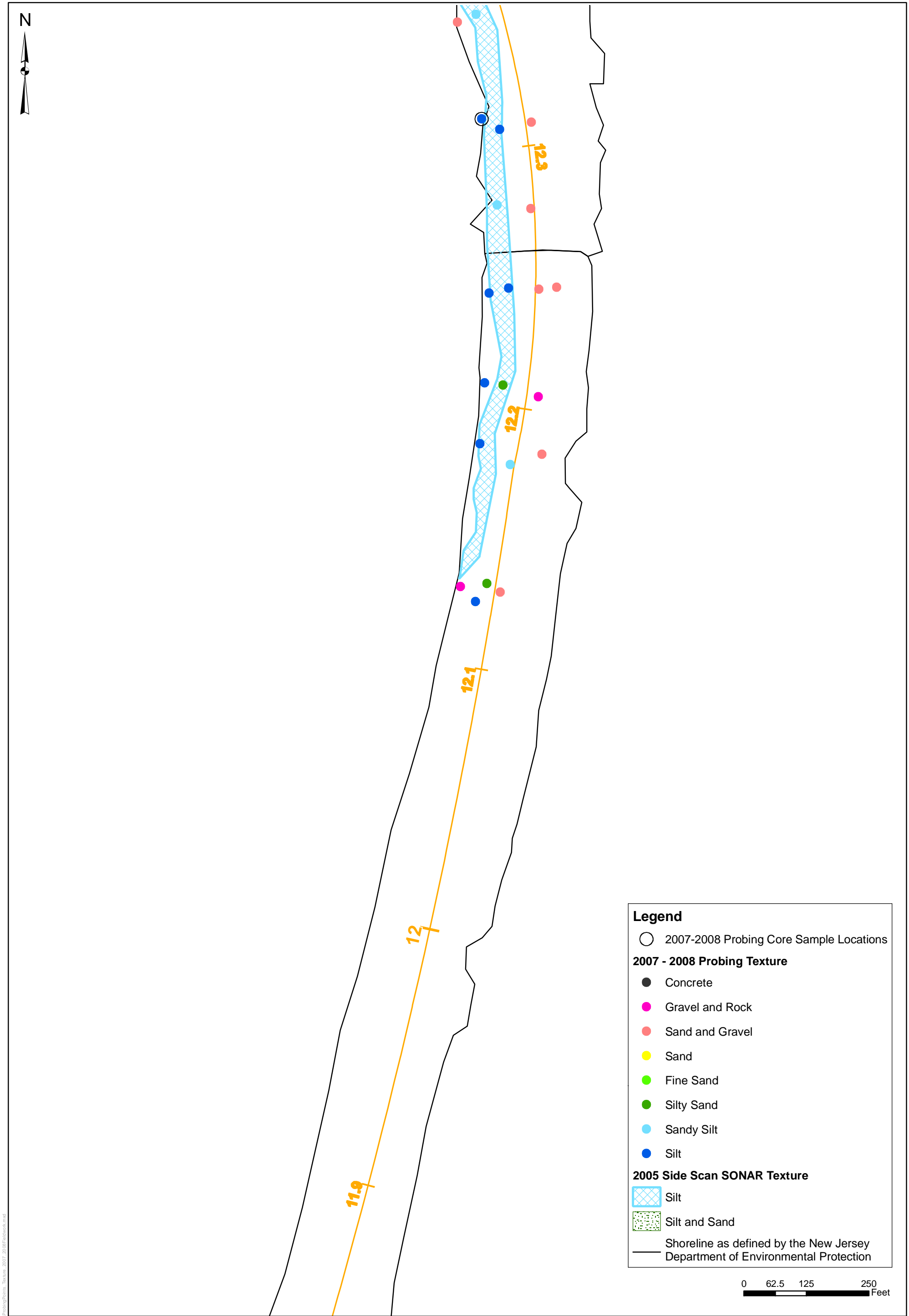
August 2008



Sediment Texture from Probing Above RM8
Lower Passaic River Restoration Project

Figure B-10

August 2008

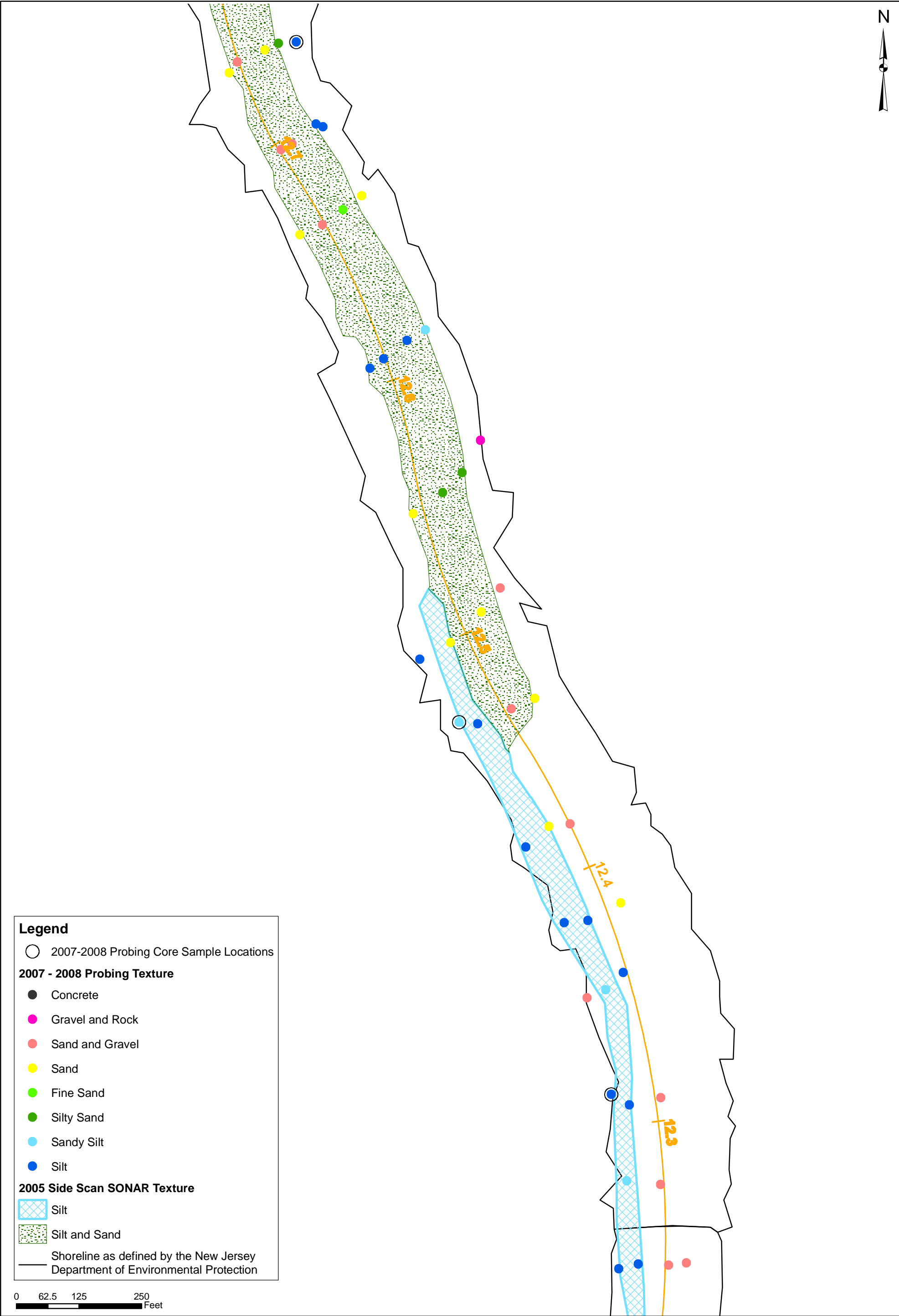


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Sediment Texture from Probing Above RM8
Lower Passaic River Restoration Project

Figure B-11
August 2008



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Sediment Texture from Probing Above RM8
Lower Passaic River Restoration Project



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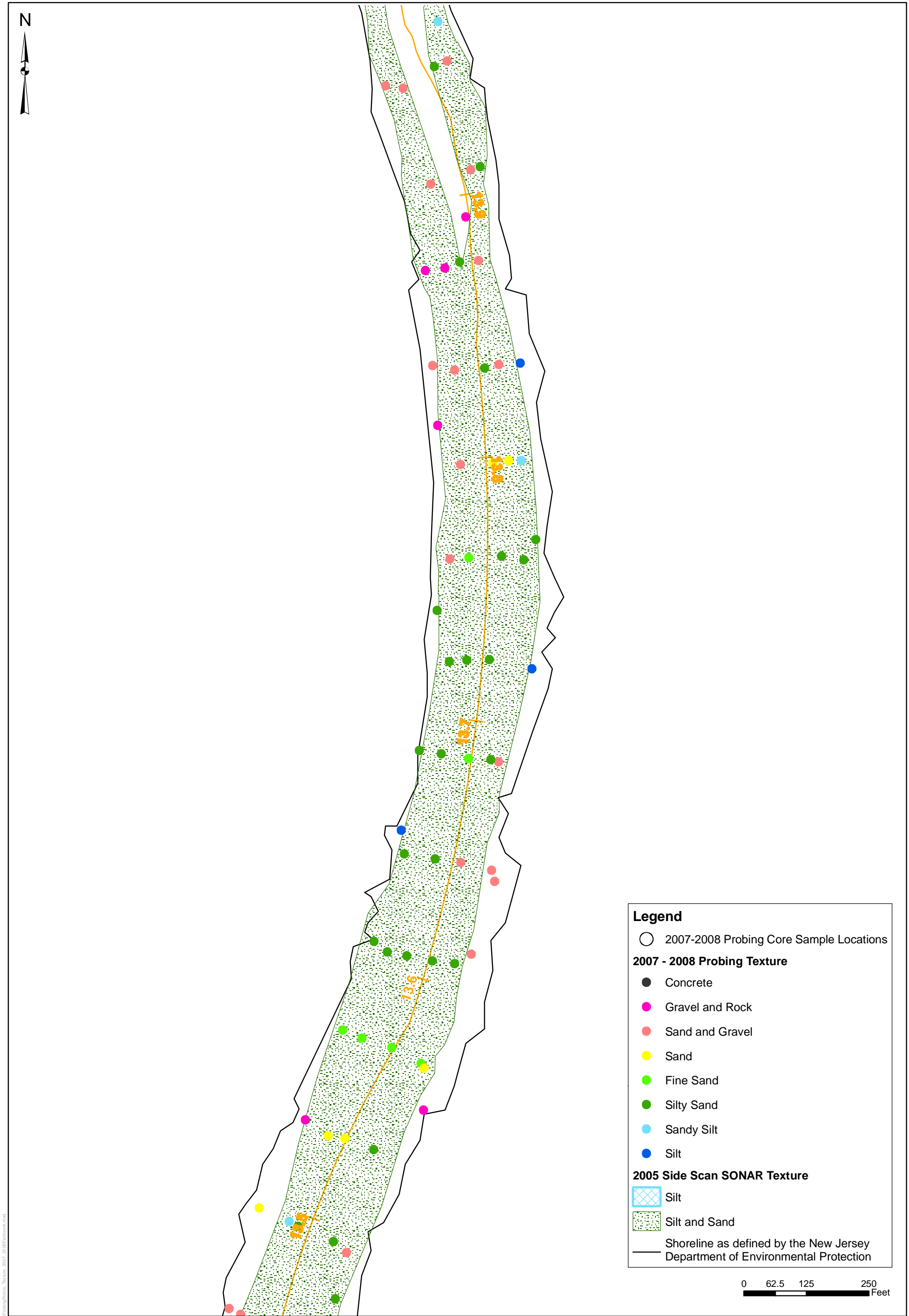
Sediment Texture from Probing Above RM8
Lower Passaic River Restoration Project

Figure B-13
August 2008



Sediment Texture from Probing Above RM8
Lower Passaic River Restoration Project

Figure B-14
August 2008



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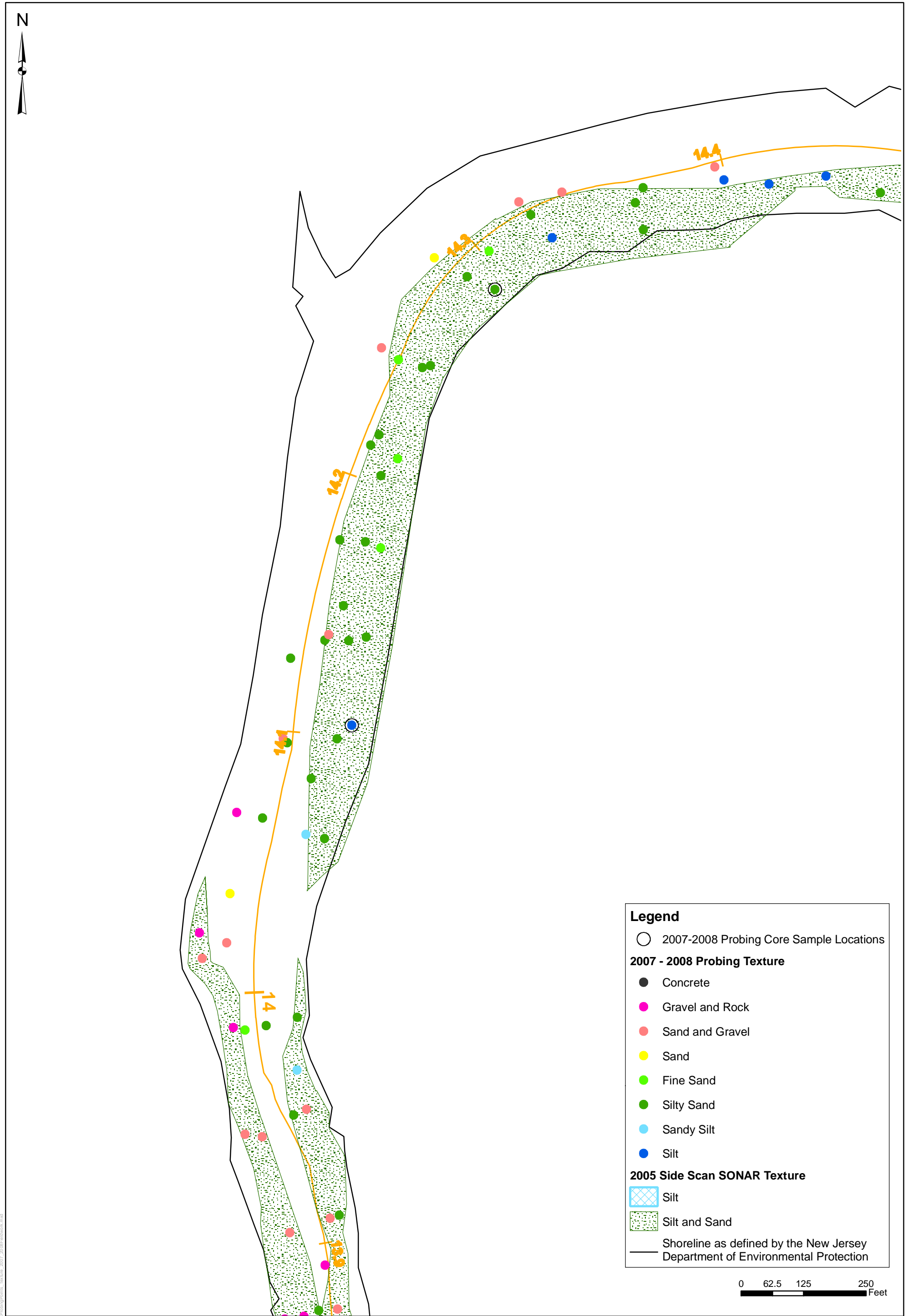


Sediment Texture from Probing Above RM8
Lower Passaic River Restoration Project

Figure B-15

August 2008

R2-0015691

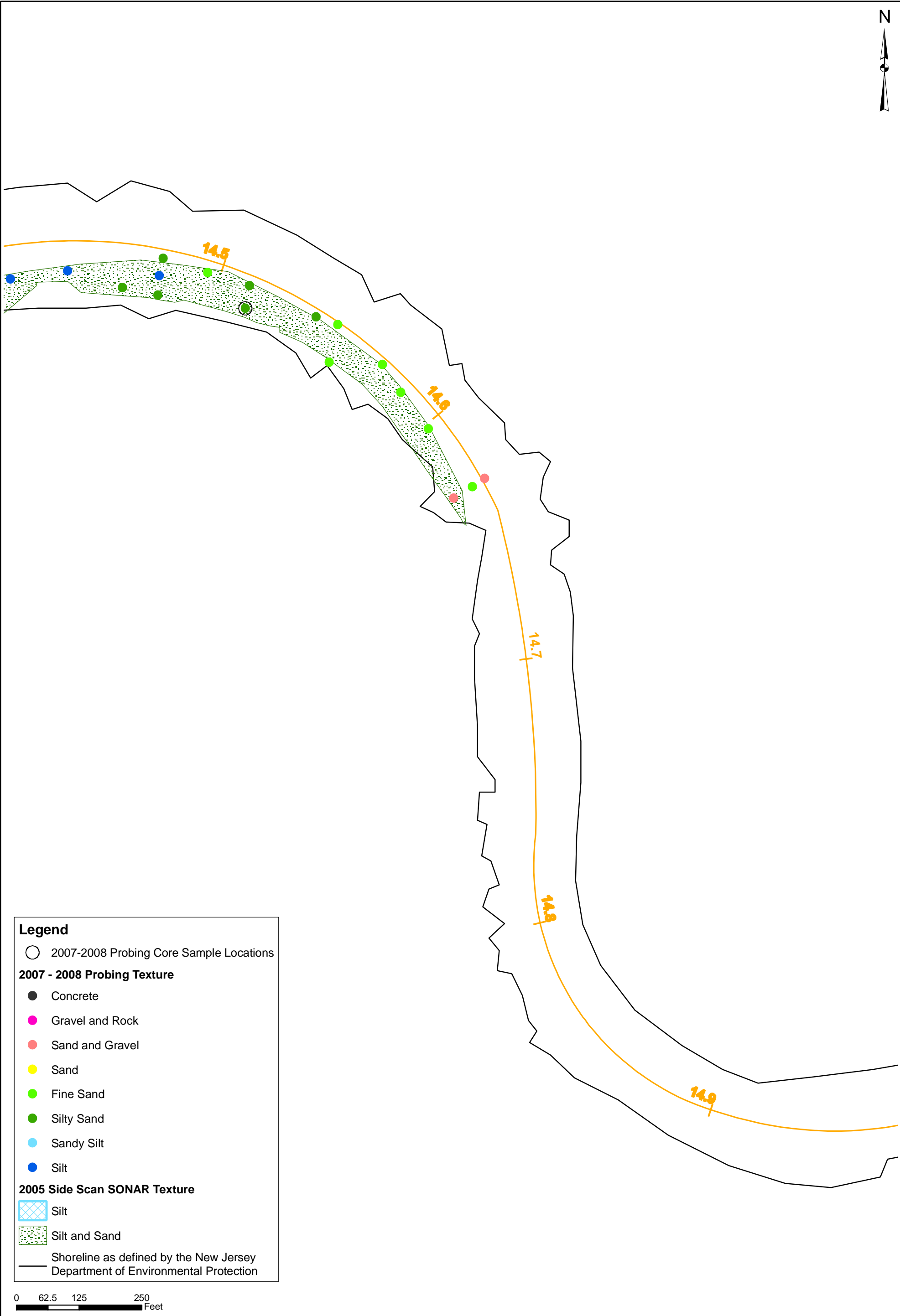


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Sediment Texture from Probing Above RM8
Lower Passaic River Restoration Project

Figure B-16
August 2008



Sediment Texture from Probing Above RM8
Lower Passaic River Restoration Project

Figure B-17

August 2008

Attachment C
Low Resolution Core Field Notes

Table C1: Low Resolution Core Field Notes

LOCATION	DATE	WATER DEPTH (ft)	PENETRATION (ft)	RECOVERY (ft)	TOP DEPTH	BOTTOM DEPTH	SAMPLE SEGMENT LENGHT (ft)	LOWRES UNIT DESCRIPTION	COMMENT	FIELD SAMPLE ID	SAMPLE INTERVAL (ft)	SAMPLE LAYER	RIVER MILE	NORTHING	EASTING
1	1/16/2008	2.20	10.5	7.75	0.00	0.50	0.50	Dark brown SILT		1A	0.50	SURFACE	8.42	711028	589643
1	1/16/2008	2.20	10.5	7.75	0.50	3.00	2.50	Dark brown SILT with trace sand		1B	2.50	SUBSURFACE	8.42	711028	589643
1	1/16/2008	2.20	10.5	7.75	3.00	3.58	0.58	Poorly sorted fine to medium SAND					8.42	711028	589643
1	1/16/2008	2.20	10.5	7.75	3.58	5.83	2.25	Silty SAND					8.42	711028	589643
1	1/16/2008	2.20	10.5	7.75	5.83	7.75	1.92	Fine to medium SAND and with some silt					8.42	711028	589643
2	1/16/2008	4.20	10.5	9.33	0.00	0.50	0.50	Dark brown SILT, trace fine sand, slight petroleum odor.		2A	0.50	SURFACE	8.5	711376	589759
2	1/16/2008	4.20	10.5	9.33	0.50	9.00	8.50	Dark brown to black SILT with trace fine sand		2B	8.50	SUBSURFACE	8.5	711376	589759
2	1/16/2008	4.20	10.5	9.33	9.00	9.33	0.33	CLAY					8.5	711376	589759
3	1/17/2008	9.33	10.5	8.50	0.00	1.50	1.50	Greyish soft SILT, with trace fine sand-silght petroleum odor		3A	0.50	SURFACE	9.33	715286	591760
3	1/17/2008	9.33	10.5	8.50	1.50	8.00	6.50	Dark grey SILT (high plasticity) with trace very fine sand-slight p		3B	7.50	SUBSURFACE	9.33	715286	591760
3	1/17/2008	9.33	10.5	8.50	8.00	8.50	0.50	Brown fine SAND with slight petroleum odor					9.33	715286	591760
4	1/17/2008	1.75	10.5	9.00	0.00	1.00	1.00	SILT with approx. 10% fine sand	Slight petroleum odor throughout recovery	4A	0.50	SURFACE	9.37	715464	591839
4	1/17/2008	1.75	10.5	9.00	1.00	6.33	5.33	SILT with trace fine sand		4B	8.50	SUBSURFACE	9.37	715464	591839
4	1/17/2008	1.75	10.5	9.00	6.33	8.00	1.67	Sandy SILT	Duplicate processed	DUP01	8.50	SUBSURFACE	9.37	715464	591839
4	1/17/2008	1.75	10.5	9.00	8.00	9.00	1.00	Silty SAND					9.37	715464	591839
5	1/17/2008	8.00	7.0	5.00	0.00	2.50	2.50	Dark grey SILT with lots of organic debris (top 6")		5A	0.50	SURFACE	9.44	715761	592068
5	1/17/2008	8.00	7.0	5.00	2.50	5.00	2.50	Brownish poorly sorted fine to medium SAND with gravel at botom 2"		5B	2.00	SUBSURFACE	9.44	715761	592068
6	1/17/2008	3.00	10.5	7.50	0.00	2.50	2.50	Dark grey SILT with trace fine sand		6A	0.50	SURFACE	9.6	716492	592416
6	1/17/2008	3.00	10.5	7.50	2.50	4.50	2.00	Poorly sorted grey fine to medium SAND with some gravel		6B	2.00	SUBSURFACE	9.6	716492	592416
6	1/17/2008	3.00	10.5	7.50	4.50	7.50	3.00	Reddish brown clayey SAND with some cobbles					9.6	716492	592416
7	1/17/2008	10.67	9.5	8.00	0.00	5.92	5.92	Dark grey SILT with trace of fine sand (soft at top 1.5')		7A	0.50	SURFACE	9.63	716717	592366
7	1/17/2008	10.67	9.5	8.00	5.92	8.00	2.08	Reddish brown fine SAND with few cobbles		7B	5.42	SUBSURFACE	9.63	716717	592366
8	1/17/2008	9.50	10.5	9.00	0.00	8.83	8.83	Greyish SILT with trace fine sand. (Loose/soft silt at top 2')		8A	0.50	SURFACE	9.75	717257	592158
8	1/17/2008	9.50	10.5	9.00	8.83	9.00	0.17	Reddish fine SAND with some cobbles		8B	8.33	SUBSURFACE	9.75	717257	592158
9	1/17/2008	4.00	10.5	7.00	0.00	1.00	1.00	Dark grey loose SILT , some organic debris		9A	0.50	SURFACE	9.94	718222	591962
9	1/17/2008	4.00	10.5	7.00	1.00	3.42	2.42	Dark grey SILT with some organice debris		9B	4.50	SUBSURFACE	9.94	718222	591962
9	1/17/2008	4.00	10.5	7.00	3.42	5.00	1.58	Sandy SILT (approx. 30% Sand)					9.94	718222	591962
9	1/17/2008	4.00	10.5	7.00	5.00	7.00	2.00	Reddish brown clayey fine SAND					9.94	718222	591962
10	1/17/2008	5.25	10.5	7.50	0.00	1.00	1.00	Black dense oily SILT		10A	0.50	SURFACE	10.05	718739	592114
10	1/17/2008	5.25	10.5	7.50	1.00	1.50	0.50	Grey Silty fine grain SAND		10B	3.00	SUBSURFACE	10.05	718739	592114
10	1/17/2008	5.25	10.5	7.50	1.50	3.42	1.92	Dark greyish SILT with ~ 15% fine sand					10.05	718739	592114
10	1/17/2008	5.25	10.5	7.50	3.42	7.50	4.08	Reddish brown clayey SAND (soft)					10.05	718739	592114
10Co-Locate	1/17/2008	5.25	10.5	8.00	0.00	0.67	0.67	Black oily SILT	Samples labelled as 21A and 21B	10ACo	0.50	SURFACE	10.05	718744	592118
10Co-Locate	1/17/2008	5.25	10.5	8.00	0.67	2.17	1.50	Grey SILT with fine to medium grain sand		10BCo	2.83	SUBSURFACE	10.05	718744	592118
10Co-Locate	1/17/2008	5.25	10.5	8.00	2.17	3.33	1.16	Poorly sorted Silty SAND and gravel					10.05	718744	592118
10Co-Locate	1/17/2008	5.25	10.5	8.00	3.33	8.00	4.67	Reddish brown CLAY					10.05	718744	592118
11	1/18/2008	7.67	10.5	9.25	0.00	9.25	9.25	Very dark brown SILT with trace sand. Petroleum odor throughout.		11A	0.50	SURFACE	10.09	718927	592124
11	1/18/2008	7.67	10.5	9.25			9.25	Very dark brown SILT with trace sand. Petroleum odor throughout.		11B	8.75	SUBSURFACE	10.09	718927	592124
11	1/18/2008	7.67	10.5	9.25			9.25	Very dark brown SILT with trace sand. Petroleum odor throughout.	Duplicate processed	DUP02	8.75	SUBSURFACE	10.09	718927	592124
12	1/18/2008	3.33	10.5	9.50	0.00	1.00	1.00	Dark brown to black SILT (soft) with some organic debris(twigs/wood)		12A	0.50	SURFACE	10.77	722512	592566
12	1/18/2008	3.33	10.5	9.50	1.00	5.33	4.33	Dark brown SILT with trace fine sand		12B	9.00	SUBSURFACE	10.77	722512	592566
12	1/18/2008	3.33	10.5	9.50	5.33	6.83	1.50	Dark brown Silty SAND					10.77	722512	592566
12	1/18/2008	3.33	10.5	9.50	6.83	8.50	1.67	Black SILT , trace fine sand, some organic material					10.77	722512	592566
12	1/18/2008	3.33	10.5	9.50	8.50	9.50	1.00	Dark brown SILT ,t race fine sand					10.77	722512	592566
13	1/29/2008	6.92	7.0	6.83	0.00	3.50	3.50	Greyish brown SILT, trace fine sand (medium plasticity)		13A	0.50	SURFACE	10.92	723173	593002
13	1/29/2008	6.92	7.0	6.83	3.50	4.58	1.08	Silty medium SAND		13B	4.44	SUBSURFACE	10.92	723173	593002
13	1/29/2008	6.92	7.0	6.83	4.58	5.17	0.59	Brownish clayey fine SAND					10.92	723173	593002
13	1/29/2008	6.92	7.0	6.83	5.17	6.83	1.66	Poorly sorted fine to medium SAND					10.92	723173	593002
14	1/29/2008	4.58	10.5	6.50	0.00	1.17	1.17	Dark brown soft SILT with trace fine sand		14A	0.50	SURFACE	10.96	723173	593154
14	1/29/2008	4.58	10.5	6.50	1.17	2.75	1.58	Dark brown to black SILT with trace medium sand		14B	2.75	SUBSURFACE	10.96	723173	593154
14	1/29/2008	4.58	10.5	6.50	2.75	3.25	0.50	Reddish brown silty CLAY					10.96	723173	593154
14	1/29/2008	4.58	10.5	6.50	3.25	5.33	2.08	Poorly sorted greysih brown fine to medium SAND					10.96	723173	593154
14	1/29/2008	4.58	10.5	6.50	5.33	6.50	1.17	Poorly sorted greyish brown medium SAND					10.96	723173	593154
15	1/29/2008	13.75	7.0	4.75	0.00	2.00	2.00	Brownish grey SILT , trace fine sand		15A	0.50	SURFACE	11.1	723535	593831
15	1/29/2008	13.75	7.0	4.75	2.00	2.17	0.17	Coarse SAND		15B	1.67	SUBSURFACE	11.1	723535	593831
15	1/29/2008	13.75	7.0	4.75	2.17	2.50	0.33	SILT, trace fine sand					11.1	723535	593831
15	1/29/2008	13.75	7.0	4.75	2.50	4.75	2.25	Reddish brown sandy SILT					11.1	723535	593831

Table C1: Low Resolution Core Field Notes

LOCATION	DATE	WATER DEPTH (ft)	PENETRATION (ft)	RECOVERY (ft)	TOP DEPTH	BOTTOM DEPTH	SAMPLE SEGMENT LENGHT (ft)	LOWRES UNIT DESCRIPTION	COMMENT	FIELD SAMPLE ID	SAMPLE INTERVAL (ft)	SAMPLE LAYER	RIVER MILE	NORTHING	EASTING
16	1/29/2008	8.25	10.5	7.25	0.00	1.33	1.33	Soft brown SILT ~ 20% fine sand and some organic debris		16A	0.50	SURFACE	11.18	723815	594177
16	1/29/2008	8.25	10.5	7.25	1.33	3.42	2.09	Dark brown SILT(medium plasticity) with trace fine sand		16B	2.92	SUBSURFACE	11.18	723815	594177
16	1/29/2008	8.25	10.5	7.25	3.42	4.83	1.41	Silty fine SAND					11.18	723815	594177
16	1/29/2008	8.25	10.5	7.25	4.83	5.33	0.50	Soft reddish brown CLAY					11.18	723815	594177
16	1/29/2008	8.25	10.5	7.25	5.33	7.25	1.92	Clayey fine SAND with gravel, some organic material. Cobbles at end					11.18	723815	594177
17	1/29/2008	9.92	10.5	6.25	0.00	2.25	2.25	Brown to black SILT (medium plasticity), trace fine sand		17A	0.50	SURFACE	11.34	724023	594981
17	1/29/2008	9.92	10.5	6.25	2.25	2.92	0.67	Brownish grey silty SAND		17B	1.75	SUBSURFACE	11.34	724023	594981
17	1/29/2008	9.92	10.5	6.25	2.92	6.25	3.33	Reddish brown fineSAND					11.34	724023	594981
18	1/16/2008	12.42	7.0	4.33	0.00	1.25	1.25	SILT, trace fine sand		18A	0.50	SURFACE	12.25	727981	596945
18	1/29/2008	12.42	7.0	4.33	1.25	2.00	0.75	Greyish brown poorly sorted fine to medium SAND		18B	2.33	SUBSURFACE	12.25	727981	596945
18	1/29/2008	12.42	7.0	4.33	2.00	2.83	0.83	SILT with trace fine sand					12.25	727981	596945
18	1/29/2008	12.42	7.0	4.33	2.83	4.33	1.50	Reddish brown fine SAND					12.25	727981	596945
19	1/29/2008	13.50	10.5	4.50	0.00	2.50	2.50	Greyish black SILT with trace fine sand		19A	0.50	SURFACE	12.36	728503	596896
19	1/29/2008	13.50	10.5	4.50	2.50	4.50	2.00	Reddish brown fine SAND		19B	2.00	SUBSURFACE	12.36	728503	596896
20	1/16/2008	7.25	9.5	4.00	0.00	0.50	0.50	Dark brown SILT, trace fine sand with wood debris		20A	0.50	SURFACE	12.39	728641	596814
20	1/16/2008	7.25	9.5	4.00	0.50	1.50	1.00	Dark brown SILT, trace sand, slight odor and stain	No odor and stain below silt	20B	1.00	SUBSURFACE	12.39	728641	596814
20	1/16/2008	7.25	9.5	4.00	1.50	2.00	0.50	Grey fine to medium poorly sorted SAND					12.39	728641	596814
20	1/16/2008	7.25	9.5	4.00	2.00	4.00	2.00	Reddish brown well sorted fine SAND					12.39	728641	596814
21	1/30/2008	7.75	10.5	7.83	0.00	2.00	2.00	Very soft dark brown SILT with trace fine sand		21A	2.00	SURFACE	10.89	723075	592804
21	1/30/2008	7.75	10.5	7.83	2.00	7.17	5.17	Dark brown dense SILT with trace fine sand		21B	5.17	SUBSURFACE	10.89	723075	592804
21	1/30/2008	7.75	10.5	7.83	7.17	7.83	0.66	Reddish brown CLAY					10.89	723075	592804
22	1/30/2008	7.00	8.0	7.50	0.00	1.75	1.75	Very soft sandy SILT with organic debris		22A	1.75	SURFACE	14.22	737909	597531
22	1/30/2008	7.00	8.0	7.50	1.75	5.00	3.25	Greyish brown fine SAND		22B	2.50	SUBSURFACE	14.22	737909	597531
22	1/30/2008	7.00	8.0	7.50	5.00	7.50	2.50	Dark brown SILT with ~10% fine sand					14.22	737909	597531
23	1/30/2008	8.33	7.5	6.42	0.00	2.50	2.50	Dark grey Silty SAND		23A	2.50	SURFACE	14.47	738362	598519
23	1/30/2008	8.33	7.5	6.42	2.50	6.42	3.92	Greyish black SILT with ~15% fine sand	Petroleum odor between 4'- 6.42'	23B	3.92	SUBSURFACE	14.47	738362	598519